

WHAT IS CLAIMED IS:

- 1 1. A method for managing extended attribute data, said
2 method comprising:
3 identifying a data area in a data space to store
4 attribute data;
5 storing the attribute data in the identified data
6 area; and
7 marking one or more bits in a bitmap corresponding to
8 the data space, wherein the marked bits
9 correspond to the identified data area.

- 1 2. The method as described in claim 1 further comprising:
2 storing an extended attribute type, a size, and an
3 offset in an extended attribute directory.

- 1 3. The method as described in claim 1 wherein the data
2 space includes an inline page and one or more outline
3 pages.

- 1 4. The method as described in claim 3 wherein the inline
2 page and the outline pages each have a corresponding
3 bitmap.

- 1 5. The method as described in claim 1 further comprising:
2 receiving an extended attribute type and the attribute
3 data;
4 calculating a number of lines needed to store the
5 attribute data in the data space, wherein the
6 data space includes an inline space and one or
7 more outline spaces;

8 analyzing a bitmap corresponding with the inline space
9 to determine whether the calculated number of
10 lines are available in the inline space to store
11 the attribute data; and
12 storing the attribute data in one or more lines
13 included in the inline space in response to the
14 analysis determining that the number of lines are
15 available.

- 1 6. The method as described in claim 5, wherein the data
2 space includes one or more outline data spaces, the
3 method further comprising:
4 analyzing one or more outline bitmaps, each of the
5 outline bitmaps corresponding with one of the
6 outline data spaces, to determine whether the
7 calculated number of lines are available in any
8 of the outline spaces to store the attribute
9 data; and
10 storing the attribute data in one or more lines
11 included in at least one of the outline spaces in
12 response to the analysis of outline bitmaps
13 determining that the number of lines are
14 available in at least one outline data space.
- 1 7. The method as described in claim 1 further comprising:
2 receiving a retrieval request from a requestor for an
3 attribute stored in the data space;
4 identifying an offset and a length in an extended
5 attribute directory corresponding to the
6 requested attribute;
7 calculating a number of lines based on the identified
8 length;

9 retrieving the calculated number of lines from the
10 data space beginning at the offset; and
11 providing the calculated number of lines to the
12 requestor.

1 8. The method as described in claim 7 further comprising:
2 calculating a last line length corresponding to a last
3 line retrieved based on the length; and
4 truncating the last line based on the last line length
5 prior to the providing.

1 9. The method as described in claim 1 further comprising:
2 receiving a deletion request for an attribute stored
3 in the data space;
4 locating an attribute offset and an attribute length
5 in an attribute directory corresponding to the
6 deletion request;
7 calculating a number of lines based on the attribute
8 length;
9 identifying a stored data area based on the attribute
10 offset and the calculated number of lines;
11 resetting one or more bits corresponding to the
12 identified stored data area in the bitmap,
13 wherein the resetting indicates that the
14 corresponding data area is available for storing
15 of a new attribute.

1 10. The method as described in claim 1 further comprising:
2 receiving a modification request for an attribute
3 stored in the data space, the request including a
4 modified attribute data;

5 locating an attribute offset and an attribute length
6 in an attribute directory corresponding to the
7 modification request;
8 calculating a stored number of lines based on the
9 attribute length and a needed number of lines
10 based on the modified attribute data;
11 identifying a current storage location within the data
12 space based on the attribute offset and stored
13 number of lines;
14 comparing the stored number of lines with the needed
15 number of lines, in response to the comparing:
16 replacing the stored attribute data with the
17 modified attribute data in the identified
18 current storage location in response to the
19 stored number of lines equaling the needed
20 number of lines;
21 resetting one or more bits corresponding to the
22 identified current storage location in the
23 bitmap, wherein the resetting indicates that
24 the corresponding data area is available for
25 storing of a new attribute, in response to
26 the stored number of lines being greater
27 than the needed number of lines;
28 relocating the modified attribute data to a
29 different data area response to the stored
30 number of lines being less than the needed
31 number of lines and determining that there
32 is an insufficient number of unused lines
33 following the current storage location to
34 store the modified attribute data; and
35 appending the modified attribute data to one or
36 more lines following the current storage

37 location in response to the stored number of
38 lines being less than the needed number of
39 lines and determining that there are a
40 sufficient number of unused lines following
41 the current storage location to store the
42 modified attribute data.

- 1 11. An information handling system comprising:
 - 2 one or more processors;
 - 3 a memory accessible by the processors;
 - 4 one or more nonvolatile storage devices accessible by
 - 5 the processors, the nonvolatile storage devices
 - 6 including one or more files and one or more
 - 7 extended attributes associated with the files;
 - 8 and
 - 9 an extended attribute management tool to manage the
 - 10 extended attributes, the extended attribute tool
 - 11 including:
 - 12 means for identifying a data area in a data space
 - 13 within the nonvolatile storage devices to
 - 14 store attribute data;
 - 15 means for storing the attribute data in the
 - 16 identified data area; and
 - 17 means for marking one or more bits in a bitmap
 - 18 corresponding to the data space, wherein the
 - 19 marked bits correspond to the identified
 - 20 data area.
 - 21 12. The information handling system as described in claim
 - 22 11 further comprising:
 - 23 means for storing an extended attribute type, a size,
 - 24 and an offset in an extended attribute directory.

1 13. The information handling system as described in claim
2 11 wherein the data space includes an inline page and
3 one or more outline pages.

1 14. The information handling system as described in claim
2 13 wherein the inline page and the outline pages each
3 have a corresponding bitmap.

1 15. The information handling system as described in claim
2 11 further comprising:

3 means for receiving an extended attribute type and the
4 attribute data;

5 means for calculating a number of lines needed to
6 store the attribute data in the data space,
7 wherein the data space includes an inline space
8 and one or more outline spaces;

9 means for analyzing a bitmap corresponding with the
10 inline space to determine whether the calculated
11 number of lines are available in the inline space
12 to store the attribute data; and

13 means for storing the attribute data in one or more
14 lines included in the inline space in response to
15 the analysis determining that the number of lines
16 are available.

1 16. The information handling system as described in claim
2 15, wherein the data space includes one or more
3 outline data spaces, the information handling system
4 further comprising:

5 means for analyzing one or more outline bitmaps, each
6 of the outline bitmaps corresponding with one of
7 the outline data spaces, to determine whether the

8 calculated number of lines are available in any
9 of the outline spaces to store the attribute
10 data; and

11 means for storing the attribute data in one or more
12 lines included in at least one of the outline
13 spaces in response to the analysis of outline
14 bitmaps determining that the number of lines are
15 available in at least one outline data space.

1 17. The information handling system as described in claim
2 11 further comprising:
3 means for receiving a retrieval request from a
4 requestor for an attribute stored in the data
5 space;
6 means for identifying an offset and a length in an
7 extended attribute directory corresponding to the
8 requested attribute;
9 means for calculating a number of lines based on the
10 identified length;
11 means for retrieving the calculated number of lines
12 from the data space beginning at the offset; and
13 means for providing the calculated number of lines to
14 the requestor.

1 18. The information handling system as described in claim
2 17 further comprising:
3 means for calculating a last line length corresponding
4 to a last line retrieved based on the length; and
5 means for truncating the last line based on the last
6 line length prior to the providing.

1 19. The information handling system as described in claim
2 11 further comprising:

3 means for receiving a deletion request for an
4 attribute stored in the data space;
5 means for locating an attribute offset and an
6 attribute length in an attribute directory
7 corresponding to the deletion request;
8 means for calculating a number of lines based on the
9 attribute length;
10 means for identifying a stored data area based on the
11 attribute offset and the calculated number of
12 lines;
13 means for resetting one or more bits corresponding to
14 the identified stored data area in the bitmap,
15 wherein the resetting indicates that the
16 corresponding data area is available for storing
17 of a new attribute.

1 20. The information handling system as described in claim
2 11 further comprising:

3 means for receiving a modification request for an
4 attribute stored in the data space, the request
5 including a modified attribute data;
6 means for locating an attribute offset and an
7 attribute length in an attribute directory
8 corresponding to the modification request;
9 means for calculating a stored number of lines based
10 on the attribute length and a needed number of
11 lines based on the modified attribute data;
12 means for identifying a current storage location
13 within the data space based on the attribute
14 offset and stored number of lines;
15 means for comparing the stored number of lines with
16 the needed number of lines

17 in response to the comparing:

18 means for replacing the stored attribute data

19 with the modified attribute data in the

20 identified current storage location in

21 response to the stored number of lines

22 equaling the needed number of lines;

23 means for resetting one or more bits

24 corresponding to the identified current

25 storage location in the bitmap, wherein the

26 resetting includes means for indicating that

27 the corresponding data area is available for

28 storing of a new attribute, in response to

29 the stored number of lines being greater

30 than the needed number of lines;

31 means for relocating the modified attribute data

32 to a different data area response to the

33 stored number of lines being less than the

34 needed number of lines and determining that

35 there is an insufficient number of unused

36 lines following the current storage location

37 to store the modified attribute data; and

38 means for appending the modified attribute data

39 to one or more lines following the current

40 storage location in response to the stored

41 number of lines being less than the needed

42 number of lines and determining that there

43 are a sufficient number of unused lines

44 following the current storage location to

45 store the modified attribute data.

- 1 21. A computer program product for managing extended
2 attribute data, said computer program product
3 comprising:
4 means for identifying a data area in a data space to
5 store attribute data;
6 means for storing the attribute data in the identified
7 data area; and
8 means for marking one or more bits in a bitmap
9 corresponding to the data space, wherein the
10 marked bits correspond to the identified data
11 area.
- 1 22. The computer program product as described in claim 21
2 further comprising:
3 means for storing an extended attribute type, a size,
4 and an offset in an extended attribute directory.
- 1 23. The computer program product as described in claim 21
2 wherein the data space includes an inline page and one
3 or more outline pages.
- 1 24. The computer program product as described in claim 23
2 wherein the inline page and the outline pages each
3 have a corresponding bitmap.
- 1 25. The computer program product as described in claim 21
2 further comprising:
3 means for receiving an extended attribute type and the
4 attribute data;
5 means for calculating a number of lines needed to
6 store the attribute data in the data space,
7 wherein the data space includes an inline space
8 and one or more outline spaces;

9 means for analyzing a bitmap corresponding with the
10 inline space to determine whether the calculated
11 number of lines are available in the inline space
12 to store the attribute data; and
13 means for storing the attribute data in one or more
14 lines included in the inline space in response to
15 the analysis determining that the number of lines
16 are available.

- 1 26. The computer program product as described in claim 25,
2 wherein the data space includes one or more outline
3 data spaces, the computer program product further
4 comprising:

5 means for analyzing one or more outline bitmaps, each
6 of the outline bitmaps corresponding with one of
7 the outline data spaces, to determine whether the
8 calculated number of lines are available in any
9 of the outline spaces to store the attribute
10 data; and

11 means for storing the attribute data in one or more
12 lines included in at least one of the outline
13 spaces in response to the analysis of outline
14 bitmaps determining that the number of lines are
15 available in at least one outline data space.

- 1 27. The computer program product as described in claim 21
2 further comprising:

3 means for receiving a retrieval request from a
4 requestor for an attribute stored in the data
5 space;

6 means for identifying an offset and a length in an
7 extended attribute directory corresponding to the
8 requested attribute;
9 means for calculating a number of lines based on the
10 identified length;
11 means for retrieving the calculated number of lines
12 from the data space beginning at the offset; and
13 means for providing the calculated number of lines to
14 the requestor.

1 28. The computer program product as described in claim 27
2 further comprising:
3 means for calculating a last line length corresponding
4 to a last line retrieved based on the length; and
5 means for truncating the last line based on the last
6 line length prior to the providing.

1 29. The computer program product as described in claim 21
2 further comprising:
3 means for receiving a deletion request for an
4 attribute stored in the data space;
5 means for locating an attribute offset and an
6 attribute length in an attribute directory
7 corresponding to the deletion request;
8 means for calculating a number of lines based on the
9 attribute length;
10 means for identifying a stored data area based on the
11 attribute offset and the calculated number of
12 lines;
13 means for resetting one or more bits corresponding to
14 the identified stored data area in the bitmap,
15 wherein the resetting indicates that the

CONFIDENTIAL - ATTORNEY'S EYES ONLY

16 corresponding data area is available for storing
17 of a new attribute.

1 30. The computer program product as described in claim 21
2 further comprising:

3 means for receiving a modification request for an
4 attribute stored in the data space, the request
5 including a modified attribute data;
6 means for locating an attribute offset and an
7 attribute length in an attribute directory
8 corresponding to the modification request;

9 means for calculating a stored number of lines based
10 on the attribute length and a needed number of
11 lines based on the modified attribute data;

12 means for identifying a current storage location
13 within the data space based on the attribute
14 offset and stored number of lines;

15 means for comparing the stored number of lines with
16 the needed number of lines;

17 in response to the comparing:

18 means for replacing the stored attribute data
19 with the modified attribute data in the
20 identified current storage location in
21 response to the stored number of lines
22 equaling the needed number of lines;

23 means for resetting one or more bits
24 corresponding to the identified current
25 storage location in the bitmap, wherein the
26 resetting indicates that the corresponding
27 data area is available for storing of a new
28 attribute, in response to the stored number

IBM COMPUTER SYSTEMS INCORPORATED

29 of lines being greater than the needed
30 number of lines;
31 means for relocating the modified attribute data
32 to a different data area response to the
33 stored number of lines being less than the
34 needed number of lines and determining that
35 there is an insufficient number of unused
36 lines following the current storage location
37 to store the modified attribute data; and
38 means for appending the modified attribute data
39 to one or more lines following the current
40 storage location in response to the stored
41 number of lines being less than the needed
42 number of lines and determining that there
43 are a sufficient number of unused lines
44 following the current storage location to
45 store the modified attribute data.

- 1 31. A method for managing extended attribute data, said
2 method comprising:
3 identifying a data area in a data space to store
4 attribute data, the data space including an
5 inline page and one or more outline pages;
6 calculating a number of lines needed to store the
7 attribute data in the data space;
8 analyzing an inline bitmap corresponding with the
9 inline page and one or more outline bitmaps
10 corresponding to the outline pages;
11 determining a storage location based on the analysis;
12 storing the attribute data in the determined storage
13 location;

14 marking one or more bits in the inline bitmap in
15 response to the storage location being included
16 in the inline page;
17 marking one or more bits in one of the outline bitmaps
18 in response to the storage location being in one
19 of the outline pages; and
20 registering an extended attribute type, a size, and an
21 offset in an extended attribute directory.

1 32. The method as described in claim 31 further
2 comprising:
3 receiving a retrieval request from a requestor for an
4 attribute stored in the data space;
5 identifying a retrieval offset and a retrieval length
6 in the extended attribute directory corresponding
7 to the requested attribute;
8 calculating a number of lines based on the identified
9 retrieval length;
10 retrieving the calculated number of lines from the
11 data space beginning at the offset; and
12 providing the calculated number of lines to the
13 requestor.

1 33. The method as described in claim 32 further
2 comprising:
3 calculating a last line length corresponding to a last
4 line retrieved based on the identified retrieval
5 length; and
6 truncating the last line based on the last line length
7 prior to the providing.

1 34. The method as described in claim 31 further
2 comprising:

3 receiving a deletion request for an attribute stored
4 in the data space;
5 locating an attribute offset and an attribute length
6 in the extended attribute directory, the
7 attribute offset and length corresponding to the
8 deletion request;
9 calculating a number of lines based on the attribute
10 length;
11 identifying a storage area based on the attribute
12 offset and the calculated number of lines;
13 resetting one or more bits corresponding to the
14 identified storage area in the inline bitmap in
15 response to the storage area identified as being
16 located in the inline page, wherein the resetting
17 indicates that the corresponding data area is
18 available for storing of a new attribute; and
19 resetting one or more bits corresponding to the
20 identified storage area in one of the outline
21 bitmaps in response to the storage area
22 identified as being located one of the outline
23 pages, wherein the resetting indicates that the
24 corresponding data area is available for storing
25 of a new attribute.

1 35. The method as described in claim 31 wherein the data
2 space is formatted into a plurality of lines.